CLAIMS

We claim:

1. A precision optical element comprising first and second aspheric surfaces, at least one of which is single point machined.

2. A precision optical element according to claim 1, and wherein both surfaces are single point machined.

3. A precision optical element according to claim 1, and wherein said single point machined surface is produced by means of a diamond tool.

4. A precision optical element according to claim 1, and wherein said element is a lens.

5. A precision optical element according to claim 1, and wherein said element is a double-sided mirror.

6. A precision optical element according to claim 1, and wherein said element comprises an infra-red transparent material.

7. A precision optical element according to claim 1, and wherein said element comprises a material selected from the group comprising germanium, zinc selenide, zinc sulphide, gallium arsenide, silicon and calcium fluoride.

8. A precision optical element according to claim 1, and wherein said element further comprises a diffractive optics pattern turned on at least one of its surfaces.

9. A precision optical element according to claim 1, and wherein the precision of at least one of said first and second surfaces is such that the maximum peak to valley irregularity is less than one wavelength of red Helium Neon laser light.

10. A precision optical element comprising first and second aspheric surfaces, at least one of which is single point machined, and which further comprises a diffractive optics pattern machined on at least one of its surfaces.

11. A precision optical element according to claim 10, and wherein both surfaces are single point machined.

12. A method of producing first and second aspheric surfaces on a precision optical element having a radial size, at least said second aspheric surface being produced by means of single point machining, and comprising the steps of:

forming said first aspheric surface on said element;

forming on a vacuum chuck, a support surface of width in its radial direction significantly smaller than said radial size of said element, and having an aspheric form matching said first aspheric surface formed on said element; and

subsequently machining said second aspheric surface on said element while it is held by said first aspheric surface in said vacuum chuck.

13. A method of producing first and second aspheric surfaces on a precision optical element according to claim 12, and wherein said step of forming said first aspheric surface of said element comprises a machining step.

14. A method of producing first and second aspheric surfaces on a precision optical element according to claim 12, and wherein said step of forming on a vacuum chuck a support surface comprises a machining step.

15. A method of producing first and second aspheric surfaces on a precision optical element according to claim 12, and also comprising the step of machining a diffractive optics pattern on at least one of said surfaces.

16. A method of producing first and second aspheric surfaces on a precision optical element according to claim 12, and wherein the precision of said optical element is such that the maximum peak to valley irregularity of at least one of its first and second surfaces is less than one wavelength of red Helium Neon laser light.

17. An optical system comprising at least one precision optical element comprising two aspheric surfaces, at least one of which is single point machined.

18. An optical system comprising at least one precision optical element according to claim 2.

19. An optical system comprising at least one precision optical element produced by means of the method according to claim 12.

20. An optical system according to claim 17, and wherein said at least one precision optical element also comprises a diffractive optics pattern on at least one surface.

21. An optical system according to claim 17, for use in thermal imaging applications.

22. An optical system according to claim 17, and wherein the precision of said optical element is such that the maximum peak to valley irregularity of at least one of its first and second surfaces is less than one wavelength of red Helium Neon laser light.

23. A vacuum chuck for holding a precision optical element having a radial dimension and a first aspheric surface, for single point machining of a second aspheric surface thereon, and comprising a support surface of width significantly smaller than said radial dimension, said support surface having an aspheric form matching that of said first aspheric surface of said element.

24. A vacuum chuck according to claim 23, and wherein the volume inside of said support surface accommodates a vacuum.

25. A vacuum chuck according to claim 23, and comprising at least one passage within said support surface which accommodates a vacuum.

26. An optical system comprising at least one precision optical element, machined in a vacuum chuck according to claim 23.